Within- and between-network functional connectivity changes in dementia with Lewy bodies and associations with core clinical symptoms
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Background: Dementia with Lewy bodies (DLB) is the second to third most common form of degenerative dementia in the elderly and is characterized by three core symptoms: visual hallucinations, Parkinsonian motor features and fluctuating levels of attention/alertness. The objective of this study is to investigate how disruptions to functional connectivity (FC) within and between several resting state networks (RSN) relate to these symptoms.

Methods: We studied resting state fMRI from 30 DLB patients and 31 healthy controls (HC) matched by age and gender. RSN spatial maps were obtained by using MELODIC from the FMRIB’s software library (FSL) with time-concatenated data from the HC group and decomposing the data set into 70 independent components. 26 of these were identified as RSNs. Subsequently, a dual regression approach was applied to find the subject-specific time courses and spatial maps associated with each of the identified RSNs. FSL’s randomize tool was used to assess significant changes in functional connectivity in the DLB group compared to HC (including covariates of no interest for age, gender and grey matter volume, 10000 permutations, p-values<0.05, TFCE corrected). Changes in between-network FC were investigated using the FSLnets package. Correlations were tested between the within- and between-network FC with significant group differences and various clinical scores relevant to the core DLB symptoms (uncorrected p-values<0.05).

Results: Decreased FC in the DLB group compared with the control group was found in several networks including the lateral visual network, the default mode network (DMN), the dorsal attention network, the precuneus network, and a cerebellar network. Increased connectivity was found in the motor network, the occipital pole network, and an occipital-cerebellar network. Between-network FC was decreased in the DLB group between the DMN and the occipital pole network and between the basal ganglia and the fronto-parietal attention network while there was increased FC between two parts of the DMN. Clinical scores of Parkinsonism in the DLB group were related to functional connectivity strength of the lateral visual network, the cerebellar network and the connection between the DMN and the occipital pole network. Visual hallucination and cognitive fluctuation scores were both associated with FC of the visual and cerebellar networks.

Conclusions: The present study shows that functional connectivity within and between several RSNs is altered in DLB patients. This includes visual, motor, attention and cerebellar networks which are related to the clinical symptoms of the disease.